

Editorial

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Market and customer pressures will drive changes in the way the core manufacturing and service industry currently does business. Customers are increasingly demanding greater reliability of products at lower total cost. Changes in public policy are likely to require plans for increased security throughout the core manufacturing and service industry. Meanwhile, infrastructure constraints and threats from new, more agile entrants will challenge the way industry players currently approach both asset optimisation and customer relationships. In order to position themselves to benefit from these changes, logistics operations need to balance product reliability with asset utilisation more evenly. This will require a shift in mindset. Moreover, core manufacturing and service industry will need to change deep seated ways of working to achieve execution excellence and organisational flexibility.

In today's high technology, quality and cost driven, competition-orientated business world, modelling and simulation methodologies play a prominent role in enhancing the performance, productivity and profitability of manufacturing and service industry supply chain. These activities cut across all organisation's functions and processes stretching from sourcing to customer service. It alleviates defects, waste, lead time, utilisation and inventory simultaneously through improving quality, reliability, availability and by building consensus amongst employees for improvement initiatives.

Simulation is the process of modelling an existing or future system and observing the behaviour of this system over time to identify and understand the factors that control the system and predict future behaviour. The value of simulation-based tools is that they give the user the ability to examine alternative designs, decisions, and plans, and allow for testing the effect of those alternatives without experimenting in a real environment, which is often cost-prohibitive or altogether infeasible.

In the industrial area, simulation has been mainly used in the past as an important support for production engineers in validating new layout choices and correct sizing of a production plant. Nowadays, simulation knowledge is considered one of the most important competences to acquire and develop within modern enterprises in different processes such as inbound and outbound logistics, asset strategy, resource allocation, transportation, storage, marketing, etc. Within the visions for 2k-enterprises, simulation is considered one of the most relevant key-success factors for companies surviving, thanks to its predictable features.

Basic tenets of modelling and simulation philosophies encompass a mixed approach that deals with mindset as well as a range of techniques to assess the work processes. Moreover, core manufacturing and service industry will need to change deep seated ways of working to achieve execution excellence and organisational flexibility.

Accordingly, this special issue is aimed at meeting the challenges posed and overcoming the existing gaps. It includes state-of-the-art manufacturing and services supply chain on some critical research issues pertaining to modelling and simulation approaches. Reviewers are accomplished research professionals in this area.

The papers included in this special issue address prominent concepts and techniques in the context of modelling and simulation in manufacturing and service industry supply Chain. We are delighted to offer six articles in this issue of the *International Journal of Business Performance and Supply Chain Modelling* to address these matters.

The first review article by Karim Labadi and Haoxun Chen demonstrated the advantages of Petri nets as modelling and analysis tools for logistics systems and reviewed the recent developments of using Petri net based approaches for modelling, performance analysis, and optimisation of supply chains. Authors have demonstrated the advantages of different variants of Petri nets as modelling and analysis tools of supply chains and reviewed the recent research efforts aiming at the development of such tools. A lot of available papers in this research area have been classified and reviewed. After analysing the research results, authors also suggested some further research directions with the goal to bridge the gap between theoretical study and practical application of the Petri net tools. Authors have concluded that although various Petri net models have been used successfully for supply chain modelling and analysis, the application of Petri net models and their associated analysis approaches to supply chain design and operation optimisation is still in its early stage. Authors hope that this review can serve to stimulate the future research in this area.

The second research article by Subramanian, Ramkumar and Narendran addresses closed-loop supply chain (CLSC) management problem from a typical business perspective and seeks to minimise the total supply chain costs. Most of the CLSC models examined in the current literature are case-specific. In this study, the integration of forward and reverse logistics is investigated by the authors. Authors have formulated a generalised multi-echelon, single time period, multi-product, closed loop supply chain is formulated as an integer linear program (ILP). Authors claimed that this model is intended to aid decision-making on issues such as material procurement, production, distribution, recycling and disposal of end-of-life (EOL) items. It also helps in the selection of locations of number of manufacturers, of distribution centres, of disposal sites and of recycling plants with the respective operation units and demand. Authors indicated that from the point of view of application to real life, the development of a decision support system (DSS) as a composite of the ILP model, methodologies for solving problems of any size and of qualitative factors will make a significant contribution in the future.

The third research paper by Rajesh Singh, Hari Om Sharma and Suresh K. Garg reviewed some of the supply chain practices and identified factors responsible for selecting best supply chain management (SCM) practices. Authors proposed that the review of the data reveals that there are many enablers that are known to influence selection of SCM practices. Keeping in view experts opinion regarding simplicity of framework for selecting SCM practices, mainly four enablers namely top management support and organisational factors, setting of business objective, analysis of market and customer behaviour, strategy development for SCM have been considered. For developing structural relationship among these enablers for selection of best supply chain practices, interpretive structural modelling (ISM) methodology has been used. Authors

have developed structural relationship by ISM among these factors. Authors have illustrated the same with a case study.

The fourth research article by Gajpal and Abad presented the variant of vehicle routing problem that considers the optimal integration of forward flow of materials from manufacturer to customers with a backward flow of materials from customers to specialised warehouses or recycling sites. The problem is called vehicle routing problem with simultaneous pickup and delivery (VRPSPD). In VRPSPD, a customer requires a given shipment to be delivered as well as a given load to be picked up simultaneously. Complete service (i.e., delivery and pickup) to the customer is provided by a vehicle in a single visit and thus the load of a vehicle fluctuates over the route. Given that the load fluctuates over the route, an important issue of VRPSPD is checking the feasibility of a route during local search. Authors have proposed the cumulative net-pickup approach for checking the feasibility of a vehicle route while performing neighbourhood search in local search schemes. The cumulative net pickup approach checks the feasibility of a single move during local search in constant time. Although other general constant time approaches such as resource-extension functions (REFs) are hinted in literature, authors proved that this is the first time an approach to check feasibility of a route in local search in VRPSPD is operationalised. Authors also claimed that the problems involving pickup and delivery are encountered increasingly in practice as companies engage in reverse logistics. Authors proposed that the cumulative net-pickup approach can be used by researchers in designing solution procedure for pickup and delivery problem and its variant.

The fifth research paper by Awad and Nassar stated that in order to achieve efficient supply chain integration for the processes or activities; the organisations should recognise and understand all the integration challenges of supply chain and the relations between those challenges. Authors found the major scope of research to present all supply chain integration challenges and to introduce a comprehensive classification that includes all perspectives (technical, managerial, and relationship). Authors have constructed a novel statistical model that explores all challenges of supply chain integration and the relations between them. Authors have validated the proposed model through an Empirical Investigation using partial least square (PLS) path modelling.

The last sixth article by Carvalho, Azevedo and Machado proposed a conceptual model that explores the relationships between lean and green practices and supply chain performance. Authors have suggested a set of lean and green SCM practices and a performance measurement system. The proposed performance measures intend to evaluate the practices influence on operational, economic and environmental supply chain's performance. Authors have investigated the possibility of merging lean and green paradigms in SCM context. These two paradigms have the same global purpose: to satisfy customer needs at the lowest possible cost to all members in the supply chain. Authors carried out a comprehensive review of the literature in order to identify the principal practices of each paradigm and thereby to support the development of a conceptual model focused on the SC performance and the lean and green practices integration. Authors have developed a model using a causal diagram to capture the supply chain dynamics. Authors claimed four research contributions from this paper. First, the identification of the conceptual relationships among lean and GSC practices and performance is a contribution that authors hope will become a forward step in the development of new theoretical approaches and empirical research in the field of SCM. Second, this conceptual model for the influence of lean and green practices on SC

performance is theory-driven and can be applied to any SC setting. Third, it contributes for the understanding of lean and green paradigms in SCM. Four, a taxonomy for lean and GSC practices at upstream, organisation and downstream has been developed and managers can use this taxonomy as a checklist to identify possible practices to achieve their strategic goals.

We hope that our readers are able to benefit as much from the work of these impressive researchers and practitioners as we have. Our team welcomes comments and suggestions from our visitors, and greatly appreciates your feedback. We look forward to building on this special issue with many more issues over the coming years, as we engage in productive dialogue that confronts the dynamic social science challenges faced in today's world.